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VETERINARY JOURNAL

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IS VETERINARY SCIENCE NECESSARY FOR THE NATIONAL WELFARE?

If the above question was asked of any member of the veterinary profession, there would be but one answer, and that, not because of any personal advantage, but because we as a body know full well the calamities which might well befall agriculture, through the breeders and organisers of large herds, if an efficient veterinary inspection was not made at every port of entry where animals are allowed to land.

Agriculture, all over the uncivilised as well as the civilised world, is the backbone of a country, and the wealth of agriculture lies in its flocks and herds. The wealth of the cattle depends on the health of the cattle, and the health of the cattle, with its freedom from contagious disease, depends on the skilled and trained veterinarian. It is fortunate for Great Britain that she is an island, and an island with no neighbour nearer than over twenty miles; as when once a disease has been stamped out or otherwise got under control, it can be kept out.

This advantage is shared by the general public as well as by those who control the diseases of human beings; for quite a number of these diseases are contagious to mankind, and are readily caught from the pets of the household and the inhabitants of the farmyard.

It is to the skilled and scientifically trained veterinarian that the public owe the wholesomeness of the food they eat, and the health of the animals they possess. If the supply of graduates is not forthcoming—and at the present time there is a great shortage—in fact there are barely enough to do more than supply the needs of the Colonial and State services—this lack of qualified veterinarians will, if allowed to go on, spell disaster for agriculture, and the farm animals upon which agriculture depends. In regard to such

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epidemics as rabies, glanders, pleuro-pneumonia, and foot-and-mouth disease, to mention only three, we are at the present moment the envy of the world, as the three former are now completely eradicated, and as regards the elusive foot-and-mouth, the statistics for 1930 showed that Germany, France, Holland, Italy and Russia had many thousands of outbreaks each month, whilst the total for Great Britain for the whole year was only eight.

It is to the practiced application of scientific veterinary teaching and training that Great Britain owes all this, and even if only for this reason alone, veterinary science *is* necessary for the nation's welfare.

Agriculture is the backbone of the nation, and the farm animals are the backbone of agriculture. The wealth of the animals depends upon the health of the animals, and the health of the animals of a country depends on the veterinary surgeon. Thus do veterinary science and agriculture go hand in hand towards a common goal.

PRACTICAL HUMANITY TOWARDS ANIMALS.

In the next issue of the Journal we propose to devote the greater part (and perhaps the whole) of its pages to the above subject, and it is particularly an appropriate time just now, as the various self-styled anti-vivisection societies have been especially active again of late in their efforts to justify their existence. That some of them are "feeling the pinch" owing to the hard financial times in which we live is quite obvious, although this does not alter their unscrupulous methods of attack on certain persons, and it is time that the truth should be placed before the public. There is an old adage that "half the truth is often a lie and a-half," and this applies very aptly to many of the statements which are issued to the general public, nine-tenths of whom just swallow these statements wholesale without any inquiry at all to verify or refute.

As an example of the wrong impression which can be gained by bald statements, statements without explanation, one has only to look back to the Parliamentary news of a recent date in which, in reply to a question from a member, the reply was given that during 1930 "450,744 experiments were performed under the Act, *of which* 432,474 *were performed without anæsthetics.* The number performed for cancer research was 25,259, *of which* 23,964 *were without anæsthetics.*" The above figures and statistics, *if taken without investigation,* appear a terrible indictment to our humanity to animals.

In the next issue considerable space will be devoted to efforts to explain the true facts of the case, for we of the veterinary profession yield to no one in the efforts we make to alleviate the sufferings of animals. Truth is truth, and to be fair to the British public one should substitute the word "observation" for "experiment," and give the Act its true designation, *i.e.* the "Prevention of Cruelty to Animals Act."

General Articles

STUDIES ON COMPARATIVE HÆMATOLOGY:

(I.) The Differential and Polynuclear Counts of Veterinary Students.

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DURING part of his tenure of the above Fellowship the writer examined sixty-nine blood films from veterinary students, with a view to determining their differential count and the nuclear morphology of the neutrophile granulocyte in terms of the polynuclear count (Ponder and Cooke, 1927).

In an examination of the blood much information may be gathered from making a differential and a polynuclear count. The former, as is well known, depends upon alterations in the distribution of the several types of white cells, whereas the latter concerns changes in the "polymorph" only. In the determination of a "standard," whatever it be for and for whichever animal it is intended, it is necessary to realise that animals may be divided arbitrarily into three groups, *i.e.*: (1) Those known to be physiologically healthy, and which, where practicable, on post-mortem examination are seen to be free from abnormalities (theoretically this should include microscopical survey of all major tissues, whereas usually it is merely a macroscopical examination which is carried out); (2) those known to be normal or average, in that they are able to accomplish their usual daily routine without discomfort; and (3) those known to be unhealthy, and as such are incapable of competing successfully with others in the recognised fields of competition.

Veterinary students do not all fall into the first of the above classes because, although they attend college day by day, perform whatever task is asked of them as satisfactorily as is customary with students, and then depart, they are not thereby excluded from having minor ailments; nor does it necessarily mean that they are in the "pink of condition." Consequently, in the analysis of data relative to such students it was necessary to determine the physiologically healthy, and to separate them from ordinary normals and abnormals. This, in the absence of facilities for making post-mortem examinations, was accomplished partly by questioning students as to their present

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and immediate past health (because frequently post-infective changes may be seen in the blood picture of apparently healthy subjects), and partly by scrutinising their blood in terms of two or more recognised standards, namely, the differential, polynuclear, Schilling, and Arneth counts.

Differential Blood Count.

The following are some of the figures given by leading authorities for the differential count of healthy human beings :—

Author.	Neutrophiles.	Eosinophiles.	Basiphiles.	Lymphocytes.	Monocytes.
Arneth (1920)	71	3	0.5	22.5	3
Barcroft (1929)	70	2	0.5	23.5	4
Buchanan (1909)...	72.5	2.5	0.5	20	4.5
Cabot (1904)	66	2.5	0.5	25	6
Emery (1921)	69.5	2.5	0.5	25	2.5
Ewing (1904)	71	3	1.0	22	3
Pappenheim (1914)	71.5	3	0.5	21	4
Piney (1928a)	60	3.5	0.5	30	6
Price-Jones (1920)	63	4.5	0.5	25	7
Roberts (1925)	59.5	2	0.34	11.6	26.6
Schilling (1929)	67	3	1.0	23	6
Average	67.4	2.8	0.6	22.6	6.6

Sixty-nine blood films obtained from thirty-four different students were stained on cover slips by Piney's (1928b) Modification of Pappenheim's Panoptic Method, and at least 300 leucocytes counted on each.

After careful analysis it was found that of the original thirty-four students only twenty-one were normal or average, and of these fourteen were believed to be physiologically healthy ; the differential count of the latter was as follows : neutrophiles, 62.23 ; eosinophiles, 3.2 ; basiphiles, 0.72 ; lymphocytes, 28.75 ; monocytes, 5.1.

It is interesting to note that many of the earlier hæmatologists give the percentage number of neutrophiles as between 70 and 75, whereas Roberts, in his examination of fifty British students at Cardiff, gives about 60 per cent. as normal ; a figure which this investigation has corroborated.

This diminution in the percentage of polymorphs usually means that there is a concomitant increase in the number of lymphocytes, but the explanation of this apparently normal relative lymphocytosis is uncertain. It may be associated with the transition from the peculiar blood picture of the newborn, where 60 per cent. of lymphocytes is characteristic in man. Piney believes that such a type of lymphocytosis may be due to mental concentration, which is supported by the conclusions of Yang (1928), who found that sympathetic

stimulation, as evoked by subcutaneous injection of adrenaline, produced in man a lymphocytosis. An actual leucocytosis occurred if the spleen was present, but in splenectomised patients only a relative lymphocytosis transpired. Menkin (1928) also showed the relationship between the sympathetics and mononuclear leucocytosis in experiments on the cat.

Unfortunately, however, there is contradictory evidence from Ponder and Flint (1927), who, in endeavouring to produce a neutrophile leucocytosis, found that pilocarpine did not produce any deflection in the polynuclear count, but only a lymphocytosis. If this occurred through stimulation of the parasympathetics, it receives confirmation from Camp (1928), who concluded (after producing leucocytosis in rabbits by the injection of various drugs) that the lymphocytes run parallel to the intensity of the tone of the parasympathetics; and the polymorphs similarly, but in relation to sympathetic tone, the spleen taking no part in these reactions.

The Polynuclear Count.

In a previous article (1930) the writer outlined the principles of this count, which briefly are as follows: The neutrophile myelocyte possesses a nucleus which is rounded; with age this becomes indented (metamyelocytic), and finally segmented (polymorphic). The individual parts of the segmented nucleus are termed "lobes," and these are seen by appropriate methods to be connected by fine chromatin filaments. In health the neutrophiles may be arranged in classes according to their nuclear complexity, depending upon whether they contain one, two, three, or more lobes, thus: Class I., 10; Class II., 25; Class III., 47; Class IV., 16; Class V., 2.

As an expression of the nuclear morphology this was considered rather cumbersome; Ponder and Flinn (1926) therefore suggested the "weighted mean" index, which is obtained by determining mathematically how many lobes the average neutrophile possesses: in man the figure is about 2.70.

In Arneth's original work on the morphology of the polymorph nucleus, he used Erlich's triacid stain, which fails to demonstrate the chromatin filaments joining the various lobes, and saw only individual nuclear masses, hence the term "polynuclear." Ponder (1926a) used the iron alum method, which stains the nuclei and filaments deeply basic, although details of character are indistinct. Surely, therefore, it can scarcely be accurate to employ the term polynuclear if the joining filaments are demonstrated, for obviously the nucleus is single (mononuclear), although in many instances polylobular.

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Slight variations in the composition of the stains and of their timing, when using Piney's technique, gives almost perfect results with the blood of all domestic animals, in that the nucleus, cytoplasm, and usually the granules or other inclusions are all clearly defined. This fact alone—the clear definition of the nuclear chromatin filaments and their relationship to the nuclear lobes—is of paramount importance, and clearly indicates the superiority of the method.

Having stained the cell satisfactorily, it becomes necessary to define a " filament," because Cooke does not do so, although he clearly states what constitutes segmentation, namely: " If there is any band of nuclear tissue except a chromatin filament connecting the different parts of the nucleus, the nucleus cannot for the purposes of the Arneth count be said to be divided."

Many cells exhibit nuclei with very definite filaments, *i.e.*, fine thin threads of chromatin joining nuclear masses. On the other hand, cells may frequently demonstrate material joining nuclear lobes, which is presumably too great in diameter to be called a filament, and which may be termed variously a strip, rod, arm, bridge, stalk, or neck. Finally, there are cells in which it is difficult to know whether the nucleus should be considered mono or polylobular. The true filament is too fine to be measured by the most sensitive screw eyepiece micrometer, and owing to optical errors cannot be satisfactorily and accurately measured after projection on to a screen, so that no " standard " diameter for a filament may be defined; in all probability, however, it is not more than 1/5th micron in diameter.

Another possible source of error consists in the interpretation of so-called " hidden lobes." The difficulty of appreciating the third dimension of cells under the microscope makes one frequently wonder if, when the nucleus has turned on itself or otherwise distorted its appearance, any lobe is being hidden and missed from the count. Having seen the variable results which occur with different workers on this subject, the writer's view is that the most satisfactory procedure is to count only those filaments which one sees, and not to endeavour to include " possible or probable " lobes.

With special features such as these in one's mind, it is easier to endeavour to interpret what a filament is and how it is formed. In practice, rather than try mentally to dissect the individual lobes of the nucleus, it is simpler to count the filaments, and then add one to determine into which class the cell should be placed.

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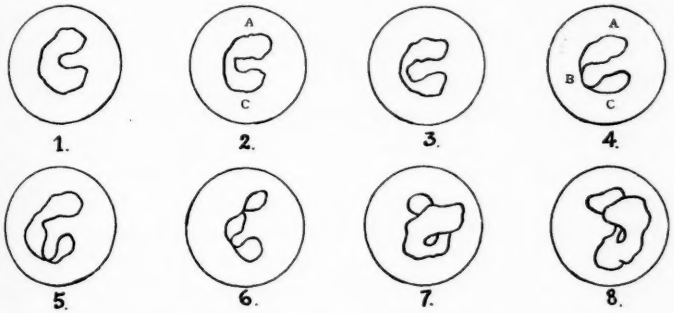
The conception thus outlined concerning the character and behaviour of the polymorphonuclear nucleus has some evidence in its favour. Schilling (1930) has stated that under dark ground illumination the nucleus is constantly changing its shape, but that no such alteration occurs to any filaments present, indicating that the filament is probably without a lumen and of firmer consistency. The nucleus can be seen to be stained by at least two tints, associated



The above diagrams illustrate the points mentioned in the consideration of the nuclear filament.

Fig. 1 indicates the intact nucleus with its more dense periphery and fluid contents. Figs. 2 and 3 show that there may be free flow from A to C, but in Fig. 4 the nucleus has so constricted itself that fluid may no longer flow from A to C; B representing the newly formed filament. The same process has occurred in Fig. 5, and in Fig. 6 there are obviously two filaments and three lobes. Figs. 7 and 8 represent cells which may conceivably contain "hidden" filaments.

with the presence of oxy- and basi-chromatin. It is not difficult to appreciate the fact that the periphery of the nucleus is always darker, and apparently condensed. Whether this is an actual membrane (nuclearlemma) or merely the condensation of the contents by surface tension is uncertain : the appearance is one of actual alteration of structure. Therefore, until further evidence is forthcoming concerning nuclear structure, there is some justification for assuming that a nucleus may not be considered divided (polymorphic) until a filament of nuclearlemma (?) is formed which prevents the passage of the more fluid contents (oxychromatin ?) from one lobe of the nucleus to another.

The "weighted mean" of the fourteen physiologically healthy students examined lay between 1.9 and 2.3, with an average of 2.02. This would indicate a severe "shift to the left" (a term used to indicate the presence of an excess number of cells in the earlier polynuclear

classes, *i.e.*, those cells with more simple nuclear complexity—younger cells), but the discrepancy which exists between the figures given by Ponder and Cooke for the " weighted mean " of normal persons, *i.e.*, 2.70, and those presented by the writer, is no doubt in great part due to the previously outlined factors, namely : (1) improved nuclear staining with increased definition of filaments ; (2) the adoption of what the writer considers to be a better standard definition of what constitutes a nuclear filament, and (3) the avoidance of " hidden lobes," and thereby the strict adherence to the counting of filaments actually seen, and the exclusion of filaments whose existence is only possible and problematical.

The " Steady State " of the " Arneth Count."

During continuous observation on one particular student (A. E. S.), it was seen that for no accountable reason the weighted mean dropped suddenly from 2.00 (normal limits 1.9 to 2.3) to 1.68 (although previously there had been a steady rise during a period of convalescence from 1.57 to 2.00 in six weeks). A similarly heavy fall was seen on a subsequent occasion : this, as before, followed the playing of a strenuous game of Rugby on the previous day. Such changes were found to be an almost constant feature consequent upon severe exercise, and in order to confirm these figures (Graph I) other students were examined.

Three students, D., K. and S. (selected from the group of physiologically healthy students) had an average weighted mean of 2.01, but the following day, after severe exercise, this figure fell to 1.78, whereas two days later it had again risen to its previous normal level, 2.02.

Actual stimulation of the hæmatopoietic system, is such it was, could not have been severe, because no abnormal cells (myelocytes or early metamyelocytes) entered the circulation ; more probably it was due to a leucocytic redistribution. Krzywanek and Arnold (1927) found that exercise in man increased the percentage of blood corpuscles, but not as greatly as in the dog or horse. Viale and Lira (1927) believe that the leucocytosis following muscular exercise is due to circulating potassium, but Keese (1926) found that the leucocytes decreased after muscular work in horses. Barcroft (1927), however, threw considerable light on the subject when he found that in the dog and cat exercise contracted the spleen from one-half to one-third its normal size, which automatically squeezed into the general circulation about one-fifth of its normal volume of blood ; this would probably alter the polynuclear picture without necessarily stimulating any blood formation.

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The conclusion has been arrived at that if the weighted mean falls outside the normal limits of variation, this effect may be either of pathological or physiological significance, for even moderately severe exercise, compatible with health, may rapidly lower the weighted mean just as in diseased processes. This considerably qualifies Ponder's remarks (1926b) concerning the " steady state " in normal blood.

Summary.

(1) Sixty-nine samples of blood from thirty-four veterinary students were examined in terms of the differential and polynuclear counts.

(2) Fourteen " physiologically healthy " students presented a differential count of : neutrophiles, 62.23 ; eosinophiles, 3.2 ; basiphiles, 0.72 ; lymphocytes, 28.75 ; monocytes, 5.1. The weighted mean of these students lay between 1.9 and 2.3, averaging 2.02. This variation from Cooke's normal figure of 2.70 is due to : (*a*) improved nuclear staining with increased definition of chromatin filaments ; (*b*) the adoption of a more clearly defined " standard " filament ; (*c*) the exclusion of " hidden lobes."

(3) Evidence is produced which shows that the weighted mean may be altered by exercise to a considerable extent ; this does not concur with Ponder's statement concerning the " steady state " of the " Arneth " count.

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THE ETIOLOGY OF "LOUPING-ILL."

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PART II.

(A) The Exposure of Sheep on Affected Pasture.

(*a*) Muzzling Experiments.

Experiment No. 1.—On April 22nd, 1896, Williams (1897) sent four presumably clean sheep by train from Edinburgh to a " louping-ill " farm. The sheep were muzzled before leaving the railway station at their destination, and were then driven by road to an affected pasture. They were regularly removed from the pasture and fed and watered in an outhouse, but they were always muzzled while at pasture. " Louping-ill " was not very prevalent on the farm that season. After eight days the sheep were returned to Edinburgh, and with the exception of one which showed tremors of the jaw and was dazed, all were in good health. The sick sheep soon recovered, but it became paralysed in the hind legs on the twenty-third day, and died the same day. One other sheep became unwell on the sixteenth day, was paralysed on the twentieth day, and died on the twenty-second day. The symptoms described were quite comparable with those of " louping-ill." There is doubt as to the efficiency with which the muzzling was carried out.

Experiment No. 2.—On May 13th, 1896, Williams obtained ten sheep from the same source as those used in Experiment 1, and arranged for them to be placed for seven days on a pasture of the

farm used for that experiment. They were then returned to Edinburgh. They were muzzled while at pasture and presumably were fed in the same way as those of the previous experiment. Few ticks were seen on the sheep, but from the context it is likely that larvæ and nymphæ might have been overlooked.

The author said that owing to the early season very few ticks were found on the farm at the time, and that there was no "louping-ill" on the farm while the sheep were there. On their return to Edinburgh no ticks were found on the sheep after a careful examination. These sheep all remained healthy.

Experiment No. 3 (Williams).—Fourteen blackfaced ewe hogs were placed on an affected farm on May 19th, 1896 (*circa*). It is not clear whether the hogs were "clean" or not. They were muzzled and turned out on the affected pasture during the day, and were fed on fields which were said to be free from the disease. The experiment was carried out by a farmer. By the seventh day he only saw one tick on each of three of them. As the season was an early one, he thought that the experiment was carried out too late in the year. On the thirteenth day one hog died, but death was not considered to be due to "louping-ill." The other sheep remained healthy.

The experiment was obviously not carried out with such care as to entitle it to much consideration.

Meek and Greig Smith (1897). *Experiment No.* 4.—Twenty Cheviot ewes (? "clean") were put on an affected pasture on April 26th. Seven were muzzled while at pasture, and were regularly fed on a place free from ticks on food specially sent to the farm. Seven were dressed with an oily mixture, and were redressed in a fortnight. The other six sheep were left as controls.

The sheep were not closely supervised. No serious results followed from the application of the dressing. On the fourth day one of the authors made an inspection, and found that there were ticks on the muzzled sheep, but that there were none on the dressed ones.

The experiment was not carried out with sufficient care to entitle it to much consideration. The supervision was so meagre as almost to be negligible. Two dressings with the oily mixture were not likely to be sufficient to repeal ticks.

One control died, probably from "louping-ill." Two of the muzzled sheep died after illnesses which were probably unconnected with "louping-ill."

Departmental Committee (1906). *Experiment No.* 5—A Cheviot ewe (? "clean") was exposed on an affected pasture on May 21st,

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1902. On the seventh day she was holding her head slightly to one side, and the symptoms became exaggerated, until by the tenth day she was lying on her side. She died on that day.

Experiment No. 6.—Six Cheviot hogs were dipped and muzzled and placed on an affected pasture on May 21st, 1903. They were removed from the pasture and fed elsewhere at night on hay "grown on the neighbouring meadow," and on turnips. Muzzling was continued for twenty-one days. One hog died on the ninth day. There was a discussion in the report as to whether ticks were in any way responsible for this death, but the arguments are invalid because of lack of knowledge concerning the life-histories and habits of ticks.

STOCKMAN (1916). *Experiment No.* 7.—Six "clean" sheep were muzzled and put on a pasture on May 2nd, 1914. They were removed every evening and fed in a shed with a wooden floor. All were free from ticks when put on the pasture.

One sheep was ill on the seventh day, and died on the tenth day, after showing symptoms of the disease. On the twentieth day another sheep became sick, but recovered. The experiment was continued till the twenty-second day. The subsequent history of the animals cannot be followed because the muzzles were removed and the sheep were allowed to graze on the "affected" pasture.

Experiment No. 8.—On April 25th, 1914, six clean sheep were put on the pasture used for Experiment No. 7. They were fed at night in a shed with a wooden floor, on oats and hay from "clean" farms. The sheep were free from ticks when the experiment started, but numerous ticks were found on them from the second day onwards.

On the twelfth day one sheep became sick and presumably died from impaction of the rumen. The remainder of the sheep remained healthy. On the fourteenth day the muzzles were removed and the sheep were left on the same pasture, but all remained healthy.

Summary.—In the above experiments it appears to be certain that a few of the muzzled sheep contracted the disease.

(*b*) THE EXPOSURE OF "CLEAN" UNPROTECTED SHEEP ON "AFFECTED" PASTURES.

MEEK AND GREIG SMITH (1897). *Experiment No.* 1.—This is part of the experiment described as No. 4 in the previous series. One out of seven exposed sheep contracted the disease.

DEPARTMENTAL COMMITTEE (1906). *Experiment No.* 2.—Four "clean" Cheviot hogs were put on an affected pasture on May 12th.

All sickened, on the 8th, 9th, and 11th, and an unknown day respectively. Three died, and one recovered. Ticks were found on all four sheep.

STOCKMAN (1916). *Experiment No.* 3.—Fourteen sheep were put on a pasture on April 21st. Five died after showing symptoms of "louping-ill." One showed typical symptoms and was killed when in an advanced stage of the disease. Three others sickened but recovered. The animals which became affected showed their first symptoms on the 9th, 13th, 14th, 17th, and 25th days respectively.

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Experiment No. 4.—Two sheep were placed on a pasture on May 2nd. One sickened on the eighth day, but recovered. The other remained healthy.

Experiment No. 5.—Six "clean" sheep were placed on a pasture on April 25th. One sickened on the ninth day, and another on the eleventh day, but both recovered.

Experiment No. 6.—Six "clean" sheep were placed on a pasture on May 25th. These sheep were placed along with those of Experiment No. 5, but they were passed through a special arsenic dip every five days with the object of observing the effect on ticks of the dipping at short intervals. Four of the sheep sickened, and three of them died. The other remained healthy. The animals which sickened showed symptoms on the 8th, 10th and 12th days respectively.

STOCKMAN (1918). *Experiment No.* 7.—Twelve "clean" sheep were placed on a pasture on April 25th. Six became visibly ill, and four of these showed paralytic symptoms and died. The author says with regard to this type of experiment: "Further observations of this kind in connection with the exposure of sheep from 'clean' farms have been carried out on the same ground for several years, and the actual mortality from 'louping-ill' has varied between 17.6 and 39.2 per cent., and a higher proportion has shown symptoms of the disease. At the end of each season the survived sheep from the experiments have been taken over by the owner of the farm as part of his own stock. In all he has taken over about thirty such sheep, and not a single one has afterwards died of 'louping-ill.'"

Summary.—While the results obtained in the few recorded experiments are exceedingly variable, it is certain that exposure of "clean" sheep on an "affected" pasture in the spring usually leads to the onset of the disease within a week or two

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(*c*) Exposure on "Affected" Pastures of Sheep which had previously reacted to what was claimed to be Infective Material.

Stockman (1918). *Experiment No.* 1.—One ram and two hogs were placed on an affected pasture on April 25th, 1918. All remained healthy. The ram had reacted to the inoculation of blood from a natural case on May 10th, 1917. One hog had reacted to the inoculation of blood from an experimental case on October 24th, 1917. The other hog had reacted to the inoculation of filtered blood from an experimental case on May 16th, 1917.

Stockman (1925). *Experiment No.* 2.—Eleven lambs were placed on a pasture from April to September, 1924. All except one had been inoculated with blood and gland juice from affected animals. The remaining lamb had been infected from larval ticks from previous cases. All remained healthy except one, which pined and died. Death was not considered to be due to "louping-ill." The author says: "The history of the farm on which the lambs were exposed to natural infection was well known. The disease during the spring of 1924 was very prevalent. Past experience had shown that when new sheep were brought on to these pastures in the spring, a mortality of 33 per cent. was to be expected."

Summary.—It is not possible to draw conclusions from these experiments.

(B) **Feeding Experiments with Plants.**

Williams (1882). *Experiment No.* 1.—Four yearling sheep were fed from May 9th, 1881, to June 15th, 1881, on withered grasses collected by Brotherston, who had suggested that a fungus, probably ergot, was responsible for the disease. The grasses fed were extensively covered with a variety of fungi, including ergot. All remained healthy.

Williams (1882). *Experiment No.* 2.—Six ewes and lambs (? six altogether or six of each) were fed on similar withered grasses to those of Experiment No. 1. All remained healthy.

Williams (1883). *Experiment No.* 3.—Sheep were fed with similar grasses to those mentioned above, but ergot was apparently added to them. All remained healthy. Apparently the sheep used in Experiment 3 were the same as those used for Experiments 1 and 2.

Summary.—Negative results were obtained when sheep were fed on herbage cut from "affected" pastures.

(C) The Effect of Contaminating Superficial Wounds similar to those produced by Ticks, with Surface Earth from "Affected" Pastures.

STOCKMAN (1918). Scarifications were made on the shoulder of a lamb, and earth from an affected pasture was rubbed into the wound. The animal remained healthy.

(D) Infection by Contact.

DEPARTMENTAL COMMITTEE (1906). *Experiment No.* 1.—Two Cheviot hogs were shut up in a small compartment in May with three affected sheep for a succession of nights. They remained healthy.

(E) The Results of Inoculating and/or feeding Animals with Material obtained from Natural Cases, excluding Material taken in such circumstances as to contain Putrefactive or other Contaminating Organisms.

One hundred and five different experiments have been traced from the publications of various authors. They involve the use of 19 ewes, 2 wethers, 223 hogs, 74 lambs, 6 pigs, 1 monkey, 17 rabbits, 10 guinea-pigs, and 2 pigeons.

The suspected materials were introduced by the following routes :—

Intra-cerebral inoculation	3	animals
Intra-cerebral and intramuscular inoculation	2	,,
Subdural inoculation	1	,,
Intra-spinal inoculation	5	,,
Intravenous inoculation	12	,,
Intravenous inoculation and inoculation into the axillary region	1	,,
Intra-peritoneal inoculation	4	,,
Intramuscular inoculation	8	,,
Intramuscular inoculation into the lumbar region	1	,,
Subcutaneous inoculation	78	,,
Intra-nasal instillation and subcutaneous inoculation	1	,,
Introduction *per os*	9	,,
Intra-rectal introduction	1	,,
Method of introduction unknown	3	,,

The experiments involved inoculations with tissues derived from most of the organs which commonly carry an infective agent in most

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of the well-known diseases, such as brain, spinal cord, liver, spleen, lymphatic gland, etc. Alimentary tract contents were also included. In most of the cases the inoculum consisted of a mixture of suspensions of different organs.

Eighty-two of the experiments were reported to give definitely negative results. Negative results were obtained from the inoculation of a representative collection of all the organs included in the list given above. Many of the experiments which yielded negative results from inoculations with blood by the subcutaneous route, were carried out on large numbers of animals, such as 88, 12, 12, 15, 20, and 22 lambs.

In discussing this part of the experimental work it will be sufficient if only the experiments which yielded positive results are discussed in any detail. Some of the animals which became ill after inoculation were obviously suffering from the administration of definitely septic materials, and these instances are left out of account. In at least a few of the experiments the animals were ill at the time of inoculation, and it is quite impossible to include these in any discussion as to the infectivity of tissues.

THE DEPARTMENTAL COMMITTEE (1906) say: "During the spring of 1902, while at Kielder, our inoculations were peculiarly unsuccessful, so much so, that we began to despair of conveying the disease by any of the recognised methods of procedure. The reason for this was, chiefly, that we had been employing for inoculation purposes, the blood, cerebro-spinal fluid, the brain and spinal cord, etc., liquids and tissues which do not usually contain the 'louping-ill' bacillus. We were ignorant also of the conditions of growth of the organism, and of the means by which it may be enabled to spore, and had not adopted the method of facilitating its engraftment by the simultaneous injection of acetic acid. Klein and McFadyean had experienced the same difficulty, and failed to communicate the disease from the above materials."

It will be convenient to review the experimental work carried out under headings according to the methods of inoculation employed.

(1) *Sub-dural Inoculation.*—Stockman (1918) inoculated Ewe 279 with brain, spinal cord, cerebro-spinal fluid, and a piece of skin containing a tick wound. It was in good health until the fifth day, when it would not feed, was breathing heavily, and died. There was broncho-pneumonia. The brain was congested but sterile.

(2) *Intra-spinal Inoculations.*—Stockman records the inoculation of three lambs and one ewe with such tissues as brain, spinal cord,

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cerebro-spinal fluid, lymphatic glands, and a piece of skin containing a tick wound The results were negative.

(3) *Intra-spinal and Intramuscular Inoculations combined.*—Stockman inoculated Lamb 236 with material from spinal cord, cerebro-spinal fluid, skin, liver, spleen, lymphatic gland, and a piece of skin containing a tick wound. The animal became paralysed and was killed on the fourteenth day.

(4) *Intra-peritoneal Inoculation.*—Stockman inoculated two rabbits with brain, spinal cord, cerebro-spinal fluid, spleen and lymphatic glands, with negative results. He records the intra-peritoneal inoculation of a monkey with brain and spinal cord with negative results.

(5) *Intravenous Inoculation.*—Four ewes, one hog and six lambs have been inoculated by various authors with such materials as brain, spinal cord, cerebro-spinal fluid, liver, spleen, lymphatic glands and peritoneal fluid. Negative results were obtained in each case with the exception of Lamb 246, which Stockman inoculated with brain, spinal cord and blood. This animal became paralysed, and was killed on the twelfth day.

(6) *Intravenous and Subcutaneous Inoculation.*—One ram, one ewe, seven lambs, and one rabbit have been inoculated with such tissues as brain, spinal cord, cerebro-spinal fluid, blood, bone marrow, spleen and lymphatic glands, always with negative results.

(7) *Intramuscular Inoculation into the Lumbar Region.*—Stockman inoculated Lamb 237 with a mixture of spinal cord, cerebro-spinal fluid, liver, spleen, lymphatic glands, and a piece of skin containing a tick wound. The animal developed a staggering gait, and died on the eighth day.

(8) *Intramuscular Inoculation.*—The only recorded inoculations were carried out by Stockman, and the inoculum was blood. One pigeon, one rabbit, one guinea-pig, four ewes, one wether and one lamb were inoculated. The ewe was killed on the eighteenth day after showing some malaise. The wether was killed on the seventeenth day after showing a temperature reaction. The rabbit, guinea-pig and pigeon gave negative reactions, but the other animals showed temperature reactions.

(9) *Subcutaneous Inoculations.*—As a large number of such inoculations have to be reviewed, they will be discussed in different categories.

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(*a*) *Inoculations with Brain, Spinal Cord and Cerebro-Spinal Fluid.*—One lamb and one hog were inoculated by the Departmental Committee (1906) with negative results.

(*b*) *Brain and Spinal Cord.*—One hog and one lamb were inoculated by the Departmental Committee (1906), and the Animal Diseases Research Association respectively, with negative results.

(*c*) *Spinal Cord.*—Pig 2,148 was inoculated by Stockman with a negative result.

(*d*) *Cerebro-spinal Fluid.*—Three hogs and four lambs were inoculated by Klein (1893), McFadyean (1894), and the Departmental Committee (1906), all with negative results.

(*e*) *Lymphatic Glands.*—Inoculations into two ewes, one hog, and fifty-two lambs carried out by Stockman and the Animal Diseases Research Association yielded negative results. Stockman records the following positive results: Ewe 12a died after inoculation, but was ill at the time inoculation was carried out. Lamb 11a became ill on the ninth day and died on the twelfth day; there was incoordination of the hind legs and a degrée of paralysis. Ewe 14 became ill on the twelfth day, but recovered. Lambs 46 and 47 died on the ninth and eleventh days respectively. Lamb 14 became sick on the twelfth day, but recovered.

(*f*) *Blood.*—Negative results were obtained by McFadyean, (1894), the Departmental Committee (1906), Stockman (1918), Stockman (1925), and the Animal Diseases Research Association, in eighteen experiments with rabbits, guinea-pigs and sheep. In most of the experiments one or at the outside two individuals were used. In those carried out by the Animal Diseases Research Association with negative results, twelve hogs, twelve hogs, fifteen hogs, twenty hogs, twenty-two hogs, five hogs, twenty-one hogs and eighty-eight hogs were used, but no temperatures were recorded. Stockman obtained a temperature reaction alone with ten lambs and one ram. In one of his experiments in which the blood was taken from the affected animal after death, a guinea-pig and a rabbit died on the third day. Ewe 45 died on the sixth day. Lamb 779 showed paralysis in addition to a temperature reaction, but apparently survived. Lamb 21/24 showed malaise in addition to a temperature reaction.

(*g*) *Visceral tissues in addition to nervous tissues.*—Fourteen experiments carried out, chiefly on lambs, but also on one or two rabbits and guinea-pigs by McFadyean (1894), by Stockman, and by the Animal Diseases Research Association, yielded negative

results. Death occurred from *Bacillus welchii* infection in one lamb inoculated in the Animal Diseases Research Association's experiments. In Stockman's experiments Lamb 49 was moribund in twenty-four hours. One rabbit and one guinea-pig died on the sixteenth and nineteenth days respectively from sepsis.

Lamb 50 died the day following inoculation. In Experiment 93 a rabbit died on the seventh day. Lamb 246 became paralysed and died on the twelfth day. Lamb 240 became paralysed and was killed on the eighth day.

(*h*) *Liver, Spleen, Lymphatic Glands and Bile.*—One or two experiments carried out by the Departmental Committee (1906), and by Stockman (1918), yielded negative results.

(*i*) *Liver, Spleen, Lymphatic Gland, Kidney and Intestine.*—A guinea-pig died on the second day.

(*j*) *Serum Inoculations* carried out on two rabbits and one guinea-pig by the Departmental Committee (1906) gave negative results.

(*k*) *Pericardial Fluid.*—Three lambs inoculated by McFadyean (1894) with pericardial fluid which had been preserved 5-19 days in sealed tubes, remained healthy. In the case of two of the lambs blood was mixed with the inoculum.

Two hogs and two rabbits inoculated by the Departmental Committee (1906) remained healthy, and of three other rabbits inoculated by that Committee, one died at the twenty-first hour; a second died on the third day, and the third survived.

(*l*) *Lymphatic Glands, Peritoneal Fluid and Blood.*—Pig 2,229 inoculated by Stockman remained healthy.

(10) *Per os.*—Experiments carried out on three pigs, one ewe two hogs, and four lambs by the Departmental Committee (1906), by Stockman and by the Animal Diseases Research Association, with such tissues or fluids as milk, skin, stomach contents, intestine, liver, spleen, lymphatic gland, kidney, piece of skin containing a tick wound, voluntary muscle, brain, spinal cord, and cerebro-spinal fluid, all gave negative results.

(11) *Infection per rectum.*—The Departmental Committee (1906) introduced intestinal material into a hog with negative results.

(12) *Method of infection unknown.*—The Departmental Committee (1906) used serum on a hog with negative results.

Stockman introduced blood into Wether 438 and Lamb 16/24, and obtained temperature reactions.

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Summary of Results Obtained from Inoculating and/or Feeding Animals with Materials obtained from Natural Cases.

The only claims of positive results from inoculations which could be valid are those described by Stockman. In his later experiments in which he recorded the temperatures, thermal reactions were produced quite regularly when the inoculum was prepared from blood or lymphatic glands.

He only recorded the production of paralysis in the following instances :—

(*a*) *Intra-spinal and Intramuscular Inoculation.*—Lamb 236 inoculated with liver, spleen, lymphatic gland, a piece of skin containing a tick wound, spinal cord and cerebro-spinal fluid.

(*b*) *Intravenous Inoculation.*—Lamb 246 inoculated with brain, spinal cord and blood.

(*c*) *Intramuscular Inoculation into the Lumbar Region.*—Lamb 237 inoculated with liver, spleen, lymphatic gland, piece of skin containing tick wound, spinal cord and cerebro-spinal fluid. This animal showed a staggering gait, but actual paralysis was not recorded.

(*d*) *Subcutaneous Inoculation.*—Lamb 246 inoculated with brain, spinal cord and blood. Lamb 240 inoculated with liver, spleen, lymphatic gland, piece of skin containing a tick wound, spinal cord and cerebro-spinal fluid. Lamb 779 inoculated with blood.

After Stockman's results were recorded, the experiments mentioned above as having been dealt with by the Animal Diseases Research Association, were carried out by Gaiger, or under his supervision ; the results were uniformly negative.

(F) **The Result of Inoculating and/or Feeding Animals with Material obtained from Inoculated Animals.**

Stockman (1916, 1919 and 1925) described twenty-four different experiments involving the use of : two heifers, six ewes, two wethers, one hog, fifty-two lambs, one pig, two rabbits, one guinea-pig, and one pigeon. The suspected materials were introduced into the test animals by intra-cerebral, intra-spinal, intra-peritoneal, intra-muscular, intra-glandular, periglandular and subcutaneous inoculation, and by instillation into the nostrils.

Materials from the liver, spleen, lymphatic glands, brain, spinal cord, cerebro-spinal fluid and blood were used.

Most of these inoculations were carried out after he had demonstrated the need for recording the temperature reactions in the experimental animals.

The following is an account of this work :—

(1) *Intra-cerebral Inoculation.*—One ewe inoculated with liver, spleen, lymphatic gland, brain and cerebro-spinal fluid remained healthy.

(2) *Intra-spinal Inoculation.*—A lamb inoculated with liver, spleen, lymphatic gland, brain and cerebro-spinal fluid remained healthy, as also did a lamb inoculated with cerebro-spinal fluid.

(3) *Intra-peritoneal Inoculation.*—A lamb inoculated with brain and cerebro-spinal fluid remained healthy, and a lamb inoculated with blood showed a temperature reaction.

(4) *Intramuscular Inoculation.*—A lamb inoculated with blood showed a temperature reaction without paralysis, and was killed on the seventh day, and another lamb showed a doubtful temperature reaction. A lamb inoculated with filtered blood showed a doubtful temperature reaction.

(5) *Intra-glandular, Periglandular and Subcutaneous Inoculation.*—A lamb inoculated with blood showed a temperature reaction.

(6) *Subcutaneous Inoculation.* (*a*) *Brain and Spinal Cord.*—Of two lambs inoculated, one became paralysed and was killed on the twelfth day, and the other died on the eleventh day. A lamb inoculated with a filtrate remained healthy.

(*b*) *Blood.*—Three lambs and a ewe failed to show reactions. Ten lambs, one ewe, one wether and a ram showed temperature reactions. One lamb died on the thirty-first day after showing a temperature reaction. A wether and two lambs showed temperature reactions and were killed on the seventh, eleventh and fourteenth days respectively after inoculation.

Of two lambs inoculated with filtered blood, one showed a negative reaction, and the other a doubtful reaction.

A heifer inoculated with defibrinated blood remained healthy.

A lamb inoculated with defibrinated blood showed a temperature reaction. A lamb inoculated with defibrinated glycerinised blood kept in cold storage for three weeks developed a temperature reaction and died on the twelfth day.

(*c*) *Lymphatic Gland.*—One inoculated ewe showed a temperature reaction. Two inoculated lambs remained healthy. Two lambs showed temperature reactions, one showed a temperature reaction

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and died on the 31st day, and one showed a temperature reaction and paralysis and died on the 12th day.

Of two lambs inoculated with filtrates, one showed a doubtful temperature reaction and the other remained healthy.

(*d*) *Lymphatic Gland and Blood.*—A lamb showed a temperature reaction and died on the thirty-first day. Another lamb showed a temperature reaction.

(*e*) *Lymphatic Gland and Spleen.*—A heifer developed an abscess at the site of inoculation but otherwise remained healthy.

(7) *Subcutaneous Inoculation and Instillation into the Nostrils.*—A lamb developed a temperature reaction.

(8) *Method of Inoculation doubtful.*—Of five lambs to which blood was administered, one remained healthy, three developed temperature reactions, and one died from other causes. One lamb developed a temperature reaction after the administration of defibrinated blood. One lamb developed a temperature reaction, and another died from causes unrelated to " louping-ill," after the administration of lymphatic gland material.

Summary.—Out of sixty-one sheep dealt with, only twenty-eight developed temperature reactions, and three became paralysed. The remainder of the sheep remained healthy.

A lamb developed a temperature reaction after the administration of washed corpuscles. A lamb remained healthy after the administration of defibrinated blood. One lamb developed a temperature reaction and lived, and another died from other causes after the administration of lymphatic gland.

(G) Effect of placing Ticks removed from " Affected " Sheep on to " Clean " Sheep.

LARVÆ.

Stockman recorded twenty-four experiments, each involving the use of one sheep. Massive infestations were resorted to in most of the experiments. All yielded negative results with the exception of the following :—

Experiment 73.—Innumerable *Ixodes ricinus* larvæ, the progeny of females found engorged on " affected " sheep, were placed on Lamb 229. This lamb was uneasy on the sixth day, but showed no definite symptoms. It was found dead on the seventh day.

Experiment 74.—Innumerable larvæ of the same origin as those used in the author's Experiment 73 were placed on Lamb 292a.

Temperatures of 104.6° to 107° F. were recorded for nine days. The animal recovered.

Experiment 14 (1925).—Adult females were taken from a natural case, Hog 802. They began laying on May 24th, 1923, and larvæ began to hatch on July 14th, 1923. Several of the larvæ were placed on Lamb 806 on August 1st, 1923, and the animal showed a temperature reaction.

NYMPHÆ.

Stockman recorded seventeen experiments in which nymphs were used. In Experiment 84, about 100 nymphs, the progeny of females taken from "louping-ill" sheep, were placed on Lamb 425. The animal developed a high temperature for a week from the eleventh day onwards.

In Experiment 85, about 100 nymphs from the same batch as those used in experiment 84, were placed on Lamb 396. It showed a doubtful temperature reaction.

ADULTS.

Stockman recorded thirteen experiments. Negative results were obtained in all cases with the exception of the following :—

Experiment 102.—Three males and one female which as nymphs had engorged on Wether 441 in Experiment 94, were placed on Ram 541 ten months after their last moult. On the eighth day the lamb showed a temperature reaction which lasted for nine days, and it recovered.

Experiment 105.—Eight females and three males were placed on Lamb 536. On the tenth day the lamb showed malaise and a temperature reaction which lasted for sixteen days.

MIXED STAGES.

Williams (1897) says: "I may here state that all the experiments with living ticks had hitherto given negative results; ticks, except small ones, and those which had not yet become adherent to the sheep, could not be induced to cling to a fresh host; no matter how many fairly or fully grown ticks were placed on a sheep, they would disappear in a few hours." He was obviously ignorant of the habits of ticks.

In one experiment "twelve living ticks, several of them being small ones," were obtained from an "affected" farm and placed on a sheep in April. The animal showed symptoms of "louping-ill" on the tenth day, and died on the twelfth day.

Meek and Greig Smith record that they placed "a number" of ticks from "affected" sheep on to two guinea-pigs, but the ticks

did not feed. The authors appear to have been ignorant about the habits of ticks.

Stockman (1916) recorded the following experiments :—

Experiment 43.—Fifty unfed larvæ and one unfed male from a badly affected pasture were placed on Lamb 219 in May. The animal remained healthy.

Experiment 44.—A mixture of about thirty larvæ and nymphs were collected from a badly " affected " pasture in May, and placed on Lambs 230 and 231. Both animals remained healthy.

Experiment 45.—In May, 1916, a considerable number of unfed larvæ, nymphs and adults were collected from a badly affected pasture and placed on Lamb 288. The lamb remained healthy.

He makes the following observation (1916) : " An interesting experiment arose somewhat unexpectedly in the following way: When affected sheep or lambs arrived at the laboratory it was customary to place them on a lawn, where they sometimes remained for several hours. Ticks in various stages dropped off the affected animals on to the lawn. On this lawn several sheep were afterwards confined from May to October. When examining these sheep during September and October, ticks in several stages were found engorging upon them. None of these sheep, all of which were susceptible, became affected with ' louping-ill,' although the ticks which infested them must in a former stage have engorged on an affected animal."

In Experiment 96, thirty larvæ, six females and four males, all of which had fed on Lamb 441 in Experiment 94, were placed on to Lamb 452. The lamb showed a temperature reaction.

Summary of Tick Experiments.

The records of these experiments do not produce convincing evidence in support of the view that the tick is the vector of "louping-ill."

(H) **Inoculations carried out with Materials from Ticks.**

The Departmental Committee (1906) described six experiments in which crushed and suspended material was used. All yielded negative results except one in which 5 c.c. of liquid, obtained by "beating-up" ticks with neutral broth, were inoculated subcutaneously into a Cheviot ewe. A local reaction was produced which soon wore off. On the ninth day the animal became ill, and it died on the tenth day. At the post-mortem examination there was no evidence of a local reaction. The authors consider that death was due to " louping-ill." There was no evidence of any attempt to sterilise the outer surfaces of the ticks befoer they were crushed.

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Stockman (1916 and 1918) recorded seven experiments, all except one of which yielded negative results, and even in this case he was doubtful if "louping-ill" had been produced.

The experiments consisted of subcutaneous or intravenous inoculation, or administration per os. In four of the experiments, eggs were washed and bruised in saline solution. In one experiment, larvæ, the progeny of females obtained from "affected" sheep, were used. In two experiments, larvæ, nymphæ, and females were crushed after washing.

Summary of Investigations carried out.

Although Stockman's most important work was published in 1916 and 1918, those responsible for dealing with "louping-ill" during the last decade have apparently held the opinion that neither its nature nor its cause are known.

The leaflet issued by the Board of Agriculture for Scotland (now the Department of Agriculture) confirms this view. The Animal Diseases Research Association has been the body chiefly responsible for giving detailed consideration to "louping-ill" during the last few years. Its annual reports contain constant references to the fact that the causation of the disease is unknown. Gaiger's articles, in 1920, expressed great doubt as to the nature of the disease, but he considered that the inoculation of the blood of "affected" sheep into healthy sheep gives protection for a short period. In the last annual report written before he vacated the post, he said (1924): "Up to the present it has not been possible experimentally to produce trembling* in healthy animals by artificial inoculation, and there is much more to be done in this connection in attempts to determine the precise cause of the disease."

After very carefully reviewing the literature, there appears to be good reason for concluding that there is doubt if an illness comparable to "louping-ill" can be produced by any ordinary method of inoculation with sufficient regularity to justify the claim that an infective agent is present within the bodies of affected animals.

The fact that "louping-ill" is a serious scourge in many parts of the country, and that a high death-rate and the occurrence of severe illness are striking features of its manifestations, compel a critic to doubt the results of experiments in which the only evidence of a positive reaction in the naturally susceptible animal is the development of a high temperature. When such a temperature as

* "Trembling" is here used as a synonym for "louping-ill."

105° F. is recorded as a febrile reaction in a sheep, there appears to be still stronger ground for doubt.

In a wide series of experiments involving inoculation by the different methods described, and with such a variety of tissues from sick animals, the occurrence of paralytic symptoms on odd occasions might not necessarily be due to a specific infective factor.

This review of the literature was written as a preliminary to the work described by Pool, Brownlee & Wilson (1930.)

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SOME OBSERVATIONS AND STUDY ON THE LIFE OF WILD ANIMALS IN ZOOLOGICAL GARDENS.*

By D. S. LAUD, G.B.V.C., F.R.H.S., F.Z.S.

Superintendent, Victoria Gardens, Byculla, Bombay.

It is a mistake to consider that wild animals in jungles are healthy and free from disease. The healthy wild animals of the jungle are in fact the survivors of the fittest—the sick and the weak, the old and the infirm having died or been killed. It is true there are fewer diseases in them than in the animals living in captivity; but the

*Read at the Seventh All-India Veterinary Conference, held at Bangalore during the Christmas of 1930, under the Presidentship of Colonel A. Olver, C.B., C.M.G., F.R.C.V.S., Expert Adviser in Animal Husbandry to the Government of India.

former, on the other hand, are exposed to grave dangers, such as the lack of care in sickness, infirmity and old age, starvation, and attacks of enemies, which is not the case with the animals in captivity.

The maximum longevity of life in them is considered to be more or less the same as is the case with the captive animals, but it is very doubtful whether they even reach that maximum age. Hagenbeck, the great naturalist and founder of the well-known Hamburg Zoo in Germany, puts down the average age of a lion or tiger in captivity to thirty years. This is also our experience. To illustrate an example, there is a very old lion in the Mysore Zoo at present, which is now kept in the open paddock in the gardens there, which, I am informed, has been the inmate of that garden ever since its inception.

It has been noticed that many wild animals captured only a short time before their admittance to zoos have been infested with a number of parasites, and these parasites, therefore, must have possibly existed in them in their wild life in the jungle, and may have been in the host when in health, only to give him the final stroke when he has become weak or has lost his vitality. Sick animals seek seclusion in their caves or dens, and do not move about, and therefore are not killed by the Shikaries as the healthy wild animals.

Some of the disease conditions are very peculiar to captivity, but it is reasonable to assume that many diseases that are found in wild animals in their captive state in the zoo also exist in the wild state. Some of the extinct races of animals may also have been ascribed to this cause. Rinderpest has caused severe losses among the wild animals, and according to the report of the Government Veterinary Surgeon of Ceylon, a large outbreak occurred among the wild pigs in that country in the year 1909.

As the result of captivity, many curious physical and mental derangements are seen in the wild animals of the zoo, and the reason is not far to seek. All such factors as unnatural and unvaried food to which the animals are not accustomed, change of climate and surroundings, fear, weariness, physical and mental degeneration, effected by the disuse of muscles and mental powers, and various other factors, react in more or less degree in a harmful manner.

Animals in captive life do not get their natural food. Some of them, like the carnivora, may approximately get their natural food, but they get it in an unnatural way. There is absolutely no variety of food given to them. For instance, they get cut meat only—muscle and bone—and not blood, guts, and glands. A lion or a

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tiger gets his meat handed to him in regular measured ration. He has no chance to tear down his prey, and the result is that the jaws of the lion or tiger bred in a zoological garden or menagerie differ very much in shape and size from the jaws of the jungle-bred animals. The zoo animals get their food regularly with the same monotony at certain prescribed and regular hours of the day, say, either in the evening or in the morning, except for a fast on Sunday once in the week, which is quite necessary for their well-being. Like the animals in the wild state, there is no alternation of feasting and fast. Certain animals in the wild state are found not to live long in captivity, and this is due to their inability to get their natural food in their unnatural condition of life and surroundings to which they are subjected. But there are many others that get used to the new diet, and thrive very well in a climate quite different from their natural habitat. Take the case of polar bears from the Arctic : they are doing well in the Mysore Zoological Gardens, and are one of the most interesting features of that zoo ; so with the pheasants from the Himalayas, like the monauls, the black-headed tragopan and pokras, or koklass, from Nepal. These pheasants thrive very well in Bombay even in March, April, and October, of course under favourable conditions of life, environment, and surroundings in which they are housed in the garden.

Deer and antelope are noticed to use a particular favourite corner and not the whole paddock, which may be large. The mortality from the cage mates has not been found to diminish very perceptibly in a large enclosure, for it is always the rule that the stronger follows the weaker, until he gets him, irrespective of the fact that the enclosure may be large. Equally true is the case with the aviary birds, and it is therefore essential to keep away those birds that are scrappy in disposition.

In captive animals mental disease is a very interesting psychological study, and there are many conditions prevalent which produce it. Masturbation is common in mammals. What is known as coprophagy—eating of their own fæces—is very common, and is chiefly noticeable in the highest apes, like the chimpanzee. Perhaps this condition may be due to some defect in the diet. Eating of fæces is not healthy, and does not occur in nature. It is the act of mental aberration.

Killing of the mates during the rutting season, or killing of the young ones by parents, are some of the insane acts seen in the inmates of the zoo. These acts would probably cause the extinction of the race if prevalent in their wild state. In the jungle life the male chooses

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his own mate, and therefore does not feel inclined to kill her, which is not the case in captivity, where a mate is chosen for him, and is forced upon him willy-nilly by his master. The natural history tells us that a lion chooses his own mate in the wilds, and proves to be an ideal husband and a dutiful father to his young ones, attending first to their care and wants. It has also been observed that a male monkey, if put together with several females, shows feelings for one particular female only, and ignores all others. By simply putting them in a cage, we cannot mate wild animals and birds. There is a sort of mutual affinity developed.

Another noticeable feature observed in captivity is that the mother devours her young ones shortly after birth. This characteristic is also seen in some of our domesticated animals like bitches and cats.

Certain other insane acts like sucking, gnawing, and eating parts of itself, or of cage mates, and making a snoring noise, which is seen particularly in bears, and grinding of teeth in primates, are common features in a variety of inmates of the zoo. All these phenomena are, it is probable, due to confinement, idleness, *ennui*, and want of occupation. These acts, however, do not often occur in nature, for the animals in the wild state are always busy in finding their own food, attending to their mates, and fighting and avoiding their enemies, etc. It will be seen that the animals in the zoo are found to be over-fed, lazy, and indolent. They are found sleeping the whole day in their dens, except during the time of feeding, when they show alertness and are active. They practically lead a monotonous life. All these factors react on their physical and mental conditions. An intelligent and sympathetic keeper is a great asset, for he plays with the animals in his charge, and thus relieves their monotony. The parents of carnivora may become quiet and tame in the zoo, and when called, come to the bars of their cages to be stroked and patted, and also fondled ; but their young ones remain wild from birth.

Nostalgia or home sickness is another characteristic of the wild animals, and is fairly evinced in birds by their migrating habits at a certain time of the year, and by certain birds returning to their original haunts for nesting every year.

Most of the wild animals are found to be sterile in captive life in the zoo. Whether the fault is with the male or with the female it is difficult to say. But some families are fertile even with the unfavourable surroundings and environment, whereas others remain sterile. Axis deer, black buck, four-horned antelope, nilgai, hog deer and sambars are all good breeders. Lions breed fairly well.

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There are instances in which they have bred twice in a year, and even thrice. Tigers and leopards are poor breeders. Zebras breed in the Gardens. In the Bombay Zoo the zebra mare born in the Gardens in the year 1918 is a very fine specimen, and it is considered to be the first instance of a zebra having been bred in this country. Another young zebra was born last year, and is now ten months old. Among the marsupials, kangaroos and wallabies breed in the zoo. Llamas are also found to breed in captivity. Bears and hyænas breed well, but the mother destroys her young after birth. It has been our experience that there is no fixed breeding period in the captive wild animals of the zoo. The period of gestation also varies in different species.

Each species of animals has its own particular complaints and diseases, its own idiosyncrasies in the way of health, which have to be studied carefully and observed from day to day. In fact, the study of natural history, the habitats of the animals in their wild state, etc., should form the groundwork. Among the principal diseases in carnivora, for instance, are diarrhœa, dysentery, paralysis, skin diseases ; worm, liver and other gastric troubles are also common diseases. The infectious diseases met with in the zoo animals are anthrax, hæmorrhagic septicæmia, foot and mouth disease, rinderpest, distemper, tuberculosis, etc. Tetanus also occurs in the solipeds and primates of the zoo. One wild ass suffered from tetanus (lockjaw) in the Gardens in January last. The animal was given injections of P. and D. anti-tetanic serum, and saturated solution of magnesia sulphate. With careful nursing and treatment this animal got over the attack. A clinical lecture was given to the senior students of the Bombay Veterinary College, and they were shown the method of control of the wild ass, and the line of treatment adopted.

Tuberculosis is found in monkeys particularly. They live generally in the hot, humid climate of the jungle, which may possibly be a predisposing cause for them to suffer from tuberculosis when taken in and confined in captivity. Heat, moisture, and humidity seem to agree with them ; but the least exposure to cold and damp brings about pulmonary affections, from which they seldom recover. Deer and carnivora do not escape the ravages of this disease in captive life.

Plague is another disease which attacks the monkeys in the zoo, and in the year 1925 there was an outbreak of epidemic amongst them in our zoo. We used the Haffkines Anti-Plague Vaccine as a preventive with very great success. There are a number of other classes of animals which have suffered from and died of plague.

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Rinderpest and foot and mouth disease affect all classes of deer and antelope. When transporting this class of bovidæ from India to foreign countries like Australia and South Africa, a certificate of health is required to be sent along with the stock to show that it is healthy, and has not been in contact with infectious disease for well nigh six months. An outbreak of rinderpest occurred in our gardens in the year 1928 amongst the spotted deer and black buck, and the use of serum alone saved nearly fifty per cent. of the stock. It was a very hard job for me to capture and inoculate these wild deer, but with great patience and tact all the animals were inoculated.

Diagnosis and treatment of sick animals of the zoo is a very difficult problem. In the first place the person in charge must be well acquainted with the study of the natural history, which must form the groundwork, and he must be in contact with the animals in health, and observe them from day to day, as each species of animals has its own peculiarities and idiosyncrasies. I have cases on record where sambars in pink of condition and health have been found on destruction to be infected with a generalised form of bovine tuberculosis, whereas their young ones, within a month after birth, have not reacted to tuberculin test. I have also a case of a sturdy, full-grown lion in the pink of health, and the father of eight litters in our gardens. This animal got suddenly ill, and the only symptoms shown were extreme constipation and torpidity of the liver, and it was suspected to be a case of intestinal obstruction. At autopsy, what was most surprising was that the liver was one mass of tubercle. Tubercle lesions were found in the mesentery, and the right lung was found infected with tubercular nodules.

From some of the facts related above it will be seen how difficult is the diagnosis, and much more so the treatment. Prophylaxis is our sheet anchor, and will always remain as such.

EPHEMERAL FEVER (THREE DAYS' FEVER) OF CATTLE IN PALESTINE.

By S. GUSTAVE ROSEN.

Veterinary Surgeon, Tiberias, Palestine.

Towards the middle of September, 1930, there appeared in the Jordan Valley an acute infectious disease among the cattle which was until now unknown to the veterinary surgeons here, and even to the old Arabic herdsmen. Until the end of this outbreak nearly 300 animals fell sick, according to my estimate, in the Jordan Valley of Lower

Galilee. The disease appeared among the improved local race of cattle in thef armers' group, as well as among the simple cattle race of the farmers, and also among the Arabic herds. But the clinical course was more severe among the better bred ones rather than the other races, and the incidence was proportionally higher among them. There was no difference in age incidence, but a smaller number of diseased was noted among the calves below one year. Oxen which were in the herd fell sick exactly as the cows. Among the Dutch bulls, being kept separate, only very few cases occurred. The outbreak did not cease in the cow-shed until the majority of the cows fell sick, lasting in an ordinary cow-shed for about two months.

The disease caused great damage, this being especially marked by the emaciation of the diseased, and the diminution of their milk production. The symptoms of the disease are: deep depression before salivation, sometimes similar to that seen in foot and mouth disease, secretion from nose, sometimes lacrimation, complete loss of appetite, and complete and sudden loss of milk. In the majority of the cases the temperature was rather low (low fever), but in some cases the temperature rose as high as 41.5° C. In the mucous membranes of mouth, nose and eyes there were no marked changes. Occasionally a faint recurrent, moist, cough was noted. Often also rigors resulted. In most of the cases there was paralysis of the rumen without tympany. Mild diarrhœa very rare. The most characteristic symptom is the pottering steps of the animal, often limited to the hind quarters only, and in severe cases leading to sacro-lumbar paralysis. The standing animal cannot move from his place. In other cases a more or less marked lameness on one leg, or on several legs, in different combinations. Sometimes the animal cannot use its legs, cannot stand up, and cannot be made to stand up even by most drastic measures. The cow is lying sometimes one or two days; there was a case where a cow stood up only after seven days, and in another single case she was lying seven weeks until slaughtered. However, the appetite and general normal feelings returned after seven days. When lifted up the cow cannot bear weight on her legs. On the affected legs no external lesions are to be found, nor are there any changes on the bones, muscles, and joints. A light tremor is sometimes seen, especially of the crural muscles. The legs and the sacrum show often signs of hypersensibility. In the middle of the sacrum an area of a hand-breadth is found hyposensitive.

On the second day of the disease the temperature drops, the other symptoms became milder, and the animal commences to eat. On the third day the improvement is still more marked, and there is

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a marked increase on the quantity of the milk. After seven days the cow has recovered, and the milk capacity returns to normal. In some cases this was only of one to two days duration, with melancholy and decrease of milk, and then the normal status returned. In two cases premature deliveries took place. About two weeks after recovery relapses occurred in a few cases. No cases of death—except one of forced slaughter—occurred among the cases observed by myself.

In the vicinity—Upper Galilee and in the Ezreel Valley, especially in the Ain-Harod block—similar cases occurred at about the same time. In the last-mentioned area the disease appeared to a larger extent and in different form. In addition to the symptoms above described, serious lung complications were observed, and caused great damage.

Diagnosis.—In the first cases the paralysis of the rumen, together with the deep depression, gave the impression of food poisoning. By a thorough examination of the fodder, this suspicion had to be dropped. On microscopical examination, I found in the blood a small number of Anaphasmes and Theileria annulata. In most cases nothing was found. As pirophasmosis is rather common in my district, I considered the above findings as being of no pathological importance, especially because the symptoms of this disease had nothing in common with the tick-borne fever.

Foot and mouth disease could not be considered, as there were no such cases in this country, and no pathological changes could be found on the mucous membranes of mouth and nose, nor on the skin of the feet.

Muscular rheumatism had also to be excluded, the hot season not being suitable to this disease, and because of the absence of any signs of the muscles, and, finally, because no such disease has ever been observed in this area either in such large numbers, nor sporadically.

Conclusions.

According to literature the above disease, "Ephemeral Fever," has appeared in South Africa, India, and Egypt. In the latter country Piot Bey suggested its resemblance to dengue fever in men. The scientific research, however, found nothing identical with dengue, nor papatacci fever.

Cause of the disease as yet unknown. Therapy: symptomatic. Epsom salt in cases of paralysis of rumen. Even without any medication the disease passes off without danger. Prophylactic measures are of no use, and therefore unnecessary. If the disease is already in the farm it is advisable to bring the different herds together, as this accelerates the transmission of the disease, and shortens the duration of the outbreak considerably.

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Clinical Articles

Equisetum Poisoning in a Herd of Cattle.

By JOHN CANE, M.R.C.V.S.
Wrexham.

In his standard text-book, "Plants Poisonous to Live Stock," Long (p. 85) opens the section devoted to *Equisetaceæ*: "A very great deal has been written on the subject of equisetosis or *Equisetum* poisoning, and even at the present day opinion is divided as to which species are poisonous, and to what extent." Since his references are entirely foreign in origin, it may be assumed that poisoning by horse-tails has rarely been recorded in this country. For these reasons it seems advisable to place on record this brief account of equisetum poisoning in a herd of cattle.

A herd of thirty-five good class commercial cows, being fed a ration of crushed oats, bran, maize meal, and dairy nuts, with a liberal allowance of hay, commenced to fall off in condition, and show some diarrhœa early in November, 1930. They tended to refuse their hay, and the owner, fearing the hay was the cause of this diarrhœa, changed to a fresh bay. This improved matters but little, and, determined to have his cows eat enough roughage, he (November 10th, 1930) chopped the hay and mixed it with the concentrates. Then it was observed that many of the cows sought to sift out the oats, meal, and cake, and leave the hay. By November 24th the great majority of the cows were diarrhœic, and had lost much condition. Some were more severely affected than others, and the total milk yield had fallen by about twenty gallons.

Although the refusal of hay was very suggestive, the fact that the change to a different bay did not improve matters placed some suspicion on the dairy nuts.

Being rather puzzled as to the cause of the trouble, I sent the history of my case, and two samples of hay and some of the dairy nuts, to Dr. Montgomerie, the Veterinary Adviser at the University College of North Wales, who also consulted his colleague, Dr. Alun Roberts, both of whom I thank for their help and the following report:

"One sample of hay contained nothing to which exception could be taken from a botanical point of view, the second sample of hay contained an astonishing proportion of horsetails, in fact this sample of 920 grams of hay contained 310 grams of *Equisetum*. Dr. Roberts indentified it as *Equisetum palustre*."

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On receipt of this information, arrangements were proposed that Dr. Montgomerie and Dr. Roberts should come and inspect the hay and pastures of the farm with me. This they very kindly agreed to do. Examination of the remaining hay at the farm showed that, while one bay was very heavily and more or less uniformly contaminated, the plant was present only in patches throughout the remainder. This farmer had had a particularly difficult hay harvest, and the carrying off of odd loads as weather permitted resulted in hay from infested land being distributed through the greater portion of his crop. It had happened that in the two bays which had recently been used a badly-infested patch had been reached.

When a fresh supply of hay was obtained the cows quickly improved in condition, the diarrhœa soon disappeared, and the milk yield of the herd showed marked improvement. Later, however, the symptoms re-appeared, and further inspection showed that a patch of equisetum-infected hay was being fed. The substitution of this fodder by hay free from the plant was followed by prompt recovery.

The examination of the pastures revealed patches of badly drained land which were very wet, and on which was found a great deal of *Equisetum*. This was readily revealed by digging up the turf, in which the ramifying roots of the plant were seen. In one meadow of ten acres a belt of the wet land ran through its whole length, and in places was quite twenty yards across. The soil in which this *Equisetum* is growing is a bowl of black peat at the foot of an extensive bank of gravel.

There is little room to doubt that this was an instance of *Equisetum* poisoning, and the species *palustre* is the one which European workers regard as certainly poisonous. The futility of chopping rejected fodder in an attempt to make the animals consume it is also emphasised by this experience.

Shivering in Cattle.

By A. LINTON ROBERTSON, M.R.C.V.S.
Arbroath.

Case 1.—I was asked to attend a cow, as it was almost impossible to milk her at times. I was told that she would nearly sit down on top of the milker. I examined the cow thoroughly, but could not find anything abnormal about her. A week later, when passing the farm about milking time, I called in and waited to see the cow milked. As soon as the milker took hold of the teats I noticed a quiver start at the cow's withers and pass quickly along the back.

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When it reached the sacrum the hind legs appeared to collapse, and the cow almost went down on her haunches. At the same time the tail was elevated and the quiver was greatly exaggerated. A few minutes later there was a decided elevation and quivering of the tail, but the hind legs were not flexed. I was informed that the condition had started about a month previously, and that there was a diminution of the milk supply for a few days.

Case 2.—Shortly after I had the above case I was asked to see another cow which was becoming dangerous to milk. In this case, as soon as the milker gripped the teats the cow's back arched, the tail shot out and quivered, and a small quantity of urine was passed. This happened three times in less than five minutes, and then the cow stood quiet till she was milked.

The cow had calved three weeks previously, and the condition, which was slight at first, gradually became worse. During her last lactation period she was quite normal.

In my opinion both cases were identical with shivering in horses, and I record them as they are the first cases I have come across, and do not remember reading about cows being affected with "shivering."

Febrile Condition in Horses Without any Apparent Cause.

By A. LINTON ROBERTSON, M.R.C.V.S.
Arbroath.

Case 1.—Some time ago I was asked to attend an aged Clydesdale mare, as she was very dull and shivering badly. I found the temperature to be 106° F., and the pulse rate to be 70. In spite of the shivering and dulness the mare was eating. I could not make a definite diagnosis, and more for the sake of doing something than for any other reason, I gave ½ gr. arecoline. Next morning the mare was normal and was put to work.

Case 2.—Six-year-old Clydesdale gelding. Temperature 106.5°, pulse 70, very dull and shivering, but eating. No definite diagnosis given. Gave ½ gr. arecoline, and next morning the animal was normal and put to work.

Case 3.—Soon after Case 2, I had a similar case at the same farm, and after having a talk with the owner, who was a sensible kind of man, I left the animal without any treatment. Next morning it was normal and went to work.

I had all three cases in December, 1924, and have not come across the condition since.

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Reviews

An Introduction to Practical Bacteriology. By T. J. Mackie and J. E. McCartney. Edinburgh: E. & S. Livingstone, Ltd. 3rd edition, 1931. Crown 8vo. Price 10*s.* 6*d.*

THE chief value of this book lies in the fact that it is essentially a guide to the student in his practical course. As the authors state in the preface to the first edition, it is not intended to serve the purpose of an abbreviated text-book, and consequently no illustrations except explanatory diagrams are included, since the student is expected to see the various organisms under his microscope and to handle the common laboratory apparatus.

The volume can be conveniently divided into two equal parts. After a short introduction to bacteriology in general (Chapter I), the first 204 pages deal with technique and the common routine laboratory tests employed in diagnosis. One might draw particular attention to Chapter III, on the use of the microscope, Chapter IV, on the cultivation of micro-organisms (including sterilisation, preparation of media, etc.), and Chapter V, on staining methods, as a good knowledge of these subjects is the only sound basis for practical work. Throughout the text important points to be noticed and common faults to be avoided are printed in italics, for example, (p. 123), special emphasis is laid on the preparation of a film for staining. "Beginners are very apt to take more material than necessary from the culture, and thus make too thick films."

The second half of the book deals systematically with the more important organisms, fungi, protozoa, and viruses. Short accounts are given of the common infecting agents of veterinary interest, and the chapter on the filtrable viruses includes notes on rabies, psittacosis, vaccinia, bovine pleuro-pneumonia, distemper, and foot-and-mouth disease. A valuable asset to the work is the space in each chapter devoted to the diagnosis of the particular disease, and the practical methods of demonstrating the presence of the causal organism.

From the veterinary standpoint one or two omissions may be noted; for example, a short account is given (p. 339) of Arloing's method of vaccination against blackquarter in cattle, but no mention is made of the use of "aggressin" or of the more recent formalised vaccine for this purpose. Such points, however, are to be expected, and in no way detract from the value of the work. As a laboratory handbook, it can be safely recommended to the veterinary student taking a course in practical bacteriology for the M.R.C.V.S., the D.V.S.M., or the B.Sc. examination.

A. B. O.

Schlachthofbetriebslehre. Dr. med. vet. Hans Kuppelmayr. Verlagsbuchhandlung von R. Schoetz, Berlin, Wilhelmstrasse 10. Pp. 212. M.12.60. (bound, M.14.50).

This treatise on Slaughter House Management, by the Director of the Munich Slaughter Houses, is written especially for the instruction of the veterinary superintendent of slaughter houses. With characteristic

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thoroughness every detail of the working of an up-to-date slaughter house is gone into, even to the organisation of the staff, the system of book-keeping and recording, and the planning of the daily work. Specimens of forms and tickets to be used are given. Rules for members of the staff, *e.g.*, the gate porter, the weighing clerk, the veterinary inspectors, etc., are set out, such as are in use in the most important slaughter houses in Germany. Meat inspection has reached a high level of efficiency in that country, and we have much to learn from her in this matter. For those who can read German, Dr. Kuppelmayr's book can be strongly recommended, for it is an excellent compendium of all that requires to be known about the working of a public abattoir.

Parliamentary News

The Position of the "Cow Doctor."

WHEN the Veterinary Surgeons Bill, 1930, before the Dail Eireann, was resumed in committee, consideration was given to the number of amendments tabled to Section 45, which in its terms precludes the handy man or cow doctor from attending livestock.

The MINISTER (Mr. McGilligan) intimated that he thought the amendment tabled by Mr. Haslett most definitely met the case, and he had been in consultation with veterinary surgeons on the matter. That amendment was as follows: "The provisions of Section 45 shall not apply to any farmer, stock owner, or their employees performing any operation or administering medicines incidental to the usual care and management of livestock, provided always that such person does not hold himself out as a veterinary practitioner or charge fees for his services."

Mr. GOREY (C. na nG.) thought this amendment was faulty in so far as that it prevented a man who had done skilful and useful work getting any recompense for his services.

In answer to the Minister, Dr. RYAN (F.F.) who had an amendment down preventing the handyman or cow doctor from suing for fees, said his idea was that he would not like to see such men deprived of gratuities, but, at the same time, he would not like to give them power to sue or enforce any claim.

Dr. HENNESSY said that Dr. Ryan's amendment, in his view, contained an immoral principle, that a man who did work should not be allowed to sue for remuneration.

Mr. CORRY (F.F.) said in his opinion the handyman was safer for many minor operations than a veterinary surgeon, and was entitled to get some payment for his work.

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Mr. HASLETT said he did not wish to take away from the owners of livestock the power to do things incidental to their care. At the same time, the profession of veterinary surgeon had to be regularised. He had no desire to set anybody else up as a veterinary practitioner except a qualified person. Farmers must have perfect liberty to manage their stock and to administer such treatment as they might consider necessary.

Mr. GOREY (C. na nG., Carlow-Kilkenny) said that the amendment did not give the farmer as much liberty as he enjoyed under the English Act. When they heard Deputy Crowley and Deputy Dr. Hennessy supporting Deputy Haslett's amendment they should examine their consciences (laughter). He had had long experience of operations on cattle and mares, and, in certain cases, he always did the job himself, though sometimes a veterinary surgeon was looking on. He thought that too much value was placed on college training, and said that more experience could be gained from live animals in the country than from dead carcases in a college.

Mr. BENNETT (C. na nG., Limerick) supported the amendment because it made clear the vagueness which farmers objected to in the original section.

Mr. O'REILLY (F.F., Kerry) also objected to the part of the amendment which excluded payment for services rendered by experienced men who were not veterinary surgeons.

Mr. MCGILLIGAN (Minister for Industry and Commerce) said Dr. Ryan's amendment made payment not recoverable in law, and Mr. Haslett's amendment excluded payment. If acceptable words could be found that matter might be adjusted, but how were they to define employee? If it included a person who was hired by a farmer or stockowner for an operation, then they might as well not have the section. There were certain operations done by certain people whom the House generally desired to except from the provisions of section 45, and he had not yet heard any better definition than a farmer or stockowner or servant ordinarily employed by such farmer or stockowner. He suggested that he should be allowed to incorporate the amendments based on Deputy Haslett's amendment into a new form modelled on that amendment, and bring it forward later on. It could be discussed with the other amendments on report.

The MINISTER'S suggestion was adopted, and the amendment, with others on the same subject, was deferred.

The Bill was then passed through Committee, and the date of the report stage announced.—*Cork Examiner.*

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News

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Annual Report of the Greyhound Club.

THE year 1930 has again been one of very satisfactory progress for the Club, and in general for the sport of greyhound racing on those racecourses that are licensed by the Stewards. The Club has still further consolidated its position as the controlling body in the conduct of the sport throughout Great Britain, and the measures for maintaining vigilant supervision over the conduct of racing on all licensed racecourses in accordance with the rules laid down, and for the correction of all offences against the rules, have been further perfected. During the year the Stewards have held 26 meetings, and have conducted 130 inquiries, and in connection therewith, have dealt in disciplinary manner with some 44 offenders by warning off, besides certain fines and lesser penalties.

As a result of the experience and careful observation of previous years, the rules of racing may now be said to have reached a certain measure of finality, and during 1930 a new book of rules, completely revised and re-codified, was issued.

In the registry department the various improvements suggested by experience have proved satisfactory. In particular the methods for the identification of greyhounds have been developed to such an exact and comprehensive extent as to be now as nearly proof against duplicity as it is possible for the Club, as an independent body, to make them. Further safeguards can be effected only through the co-operation of other bodies.

During 1930, 5,395 new registrations of greyhounds were effected, together with 2,650 transfers of ownership, 344 partnerships, 299 leases, and 357 authorities to act, while 5,739 new identity books were issued. In the National Greyhound Racing Calendar the results of some 44,268 races were recorded, a work which entails an enormous amount of careful observation and scrutiny. There has been a notable increase in the number of private trainers, and during the year the licensing of all kennelmen was resolved upon and put into effect.

During the year the relations between the National Greyhound Racing Club and the National Greyhound Racing Society as the representative body of the licensed tracks have been of the best; and the co-operation that exists between the two bodies has played no small part in the steady progress and improvement which the sport

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as a whole continues to show year by year. The Stewards note with pleasure that the official figures published by the National Greyhound Racing Society, showing an attendance in 1930 of 17,119,120 at licensed racecourses, mark yet another advance on previous figures, and afford a striking testimony of the confidence and favour that the sport has attained with the public.

R.A.V.C. Annual Dinner.

The annual dinner of officers of the Royal Army Veterinary Corps, past and present, will be held at the Hotel Victoria on Friday, June 12th, 1931, at 8 p.m. Gentlemen desirous of attending should inform the Honorary Secretary, R.A.V.C. Dinner, War Office, Whitehall, London, S.W.1.

Correspondence

THE USE OF SWINE FEVER SERUM.

To the Editor of THE VETERINARY JOURNAL.

SIR,—I should esteem it a favour if you would insert a note in the Journal regarding my article on Swine Fever Serum. The Swine Fever Serum of Bayer's used was not Behring, which was not then available. This latter is claimed to be very potent in acute cases, but for the above reason I had no opportunity of testing it.

Yours faithfully,

JOHN M. BUCHANAN, M.R.C.V.S.

Stowmarket.

Personal

WE are pleased to note that Professor A. C. Aggarwala, B.Sc., M.R.C.V.S., who graduated from the London College in 1924, and and who is now the Professor of Hygiene and Animal Husbandry in Punjab Veterinary School, has been awarded a Medal by L'Académie Vétérinaire de France, in appreciation of a book which he has recently written on "The Art of Milking." Professor Aggarwala has also been promoted to the rank of Captain in the Reserve of Officers (Veterinary) of the Army in India.

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